Captive breeding of the Small Indian Civet *Viverricula indica* (É. Geoffroy Saint-Hilaire, 1803)

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Abstract

Breeding Small Indian Civets *Viverricula indica* were observed in two captive colonies in Trichur District of Kerala, south India. One colony was kept in traditional wooden cages individually, except for short periods of pairing. The other colony lived in an open enclosure of tiles and cement. Milk, cooked rice, and bananas formed the regular diet with occasional supply of frogs, garden lizards, rats, chicken, beef, papaya, and pineapple. Frequency of scent-marking increased from 8.2 to 19.5 per 2-hour period in males and from 6.3 to 11.5 in females during the breeding season, and declined considerably after mating. Out of four successful matings, the mean gestation period was 67 days. Litter size varied from two to five. Kittens weighed between 90 and 110 g at birth. They started eating solid food, especially fruits and bits from the mother's food, by the fourth week after birth. Only two months after delivery did females regain the perineal glandular marking activity. Scent-marking by the young was first observed when they were eight weeks old, but the glandular secretion was observed on the marking sites only when they were eight months old. Further information is needed to design optimal holdings for captive breeding civets. Such captive breeding could, if well executed, lower pressure on wild populations, which are harvested for collection of the perineal gland secretion.

Keywords: India, Kerala, litter size, perineal gland secretion, scent-marking

Introduction

The Small Indian Civet *Viverricula indica* (É. Geoffroy Saint-Hilaire, 1803) has been heavily used as a wildlife resource for its prized perineal gland secretion (known as 'civet') since time immemorial. In Kerala (south India), several captive civet holdings are located (Xavier 1994, Balakrishnan 2002, Balakrishnan & Sreedevi 2007). The civet owners are not interested in breeding their civets, as the glandular secretory output is considerably reduced during pregnancy and lactation. Old and dead civets are

Fig. 1. A male Small Indian Civet is sniffing the posterior quarters of a female in oestrus, during breeding activities under captivity.

replaced by fresh ones trapped from the wild. This practice has been one of the reasons for the suspected depletion of the civet populations in south India, in addition to habitat disruption as an impact of human population explosion. Maintenance of civets under captivity is illegal without a license under the Indian Wildlife (Protection) Act 1972. However, as the perineal gland secretion of the civet is a major ingredient in a number of Ayurveda Pharmaceuticals (a traditional system of south Indian medicine), and as it is costly, civets continue to be maintained for this valuable natural resource. If a model civet breeding farm can be established with a valid license, it can be developed as a sustainable wildlife resource, as envisaged under the Convention on Biological Diversity (UNEP 1992), to reduce pressure on natural populations of this civet.

Due to their solitary and nocturnal habits, little is known about the reproductive processes and behaviour of civets (Ewer & Wemmer 1974, Prater 1980, Balakrishnan 2002). Small Indian Civet is known to have two breeding seasons, the first during February–April and the second during August–September (Hongfa & Helin 1995). The present study focuses on the breeding and related activities of the Small Indian Civet with a major objective of developing a captive breeding population, so as to conserve their natural populations by reducing trapping pressure.

Methods

Breeding and related activities of civets were observed in two captive populations; eight animals maintained in Chalakkudy and six animals in Vallachira, both in Trichur District in the state of Kerala, south India. These civets were originally brought from the wild. The colony in Chalakkudy was originally established for the extraction of the perineal gland secretion, whereas the one in Vallachira was established only for the present investigation. Civets in Chalakkudy were maintained individually in traditional wooden cages (size: 120 × 45 × 60 cm), but (for this investigation) were kept together for short periods, to allow pairing. The Vallachira colony was established in an open enclosure (240 × 120 × 90 m), made of tiles and cement. There were three Coconut *Cocos nucifera* trees, one Jack tree *Artocarpus heterophyllus* and one Papaya tree *Carica papaya* in this enclosure. Besides these, various fruiting bushes such as the West Indian Cherry *Malpighia glabra*, Bakery Cherry *Carissa carandas* and Cheruthudali (or Kottaipazham) *Zizyphus oenoplia* were planted inside the enclosure. The floor of the enclosure was covered with natural grass already present in the area. An artificial pond planted with lotus *Nelumbo nucifera* and containing a few fish (*Tilapia* and *Anabas*) was maintained. Six burrows measuring 75 × 60 × 45 cm were made in the open enclosure with mud, clay and bricks for the animals to rest and hide in. All the six individual civets had access all round the open enclosure.

Each civet in Chalakkudy was fed 200 g rice mixed with 50 ml milk daily. Chicken, beef, and eggs were supplied 2–3 times per week. Plantain *Musa paradisiaca*, birds such as crow *Corvus* and pigeon *Columba*, rats *Rattus*, and garden lizards *Calotes* were also given, when available. All feeding was during 17h30–18h00. The Vallachira colony was maintained on a regular diet of beef/chicken (100 g), milk (50 ml), one egg and 3–4 plantains per animal per day. Frogs *Rana*, garden lizards, rats and fruits such as papaya and pineapple were also supplied when available. Animals were fed during 18h00–18h30.

Observations were made regularly on breeding-related behavioural patterns, pregnancy and maternal care of both these populations of civets during 1994–1997. Night observations were made under a 20 W bulb. The unit observation time was two hours, and a total of 3,500 hours of night observations were made because the civets were predominantly nocturnal. Data were recorded on standardised forms. The behavioural activities were also videographed. Additional information on breeding and related activities of the civets was gathered from staff of the civet holdings.

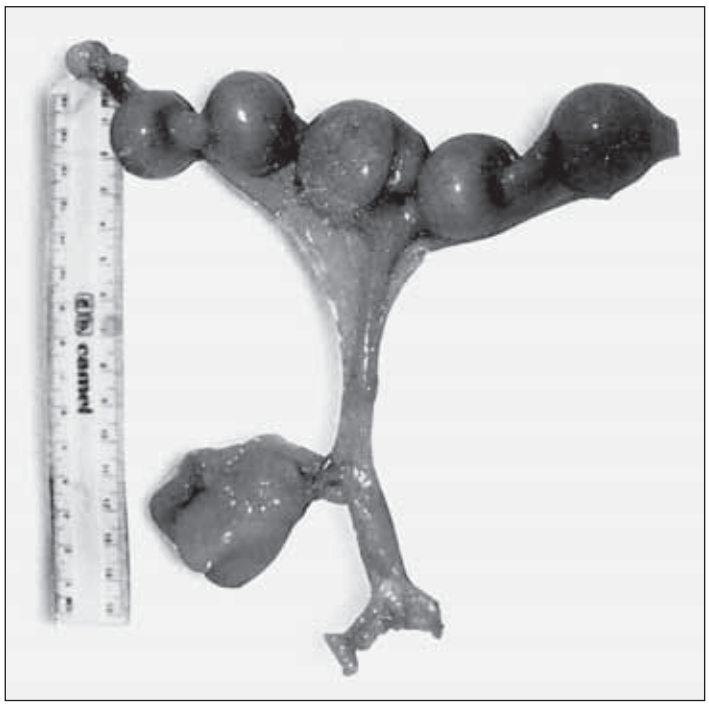

Fig. 2. The fallopian tube of a pregnant civet with five foetuses at approximately 30–35 days of pregnancy. The foetal membrane of the middle one is cut open.

Fig. 3. The genital organs of a pregnant civet with two fully-grown foetuses.

Fig. 4. A mother civet with its newly born kittens, six hours after parturition.

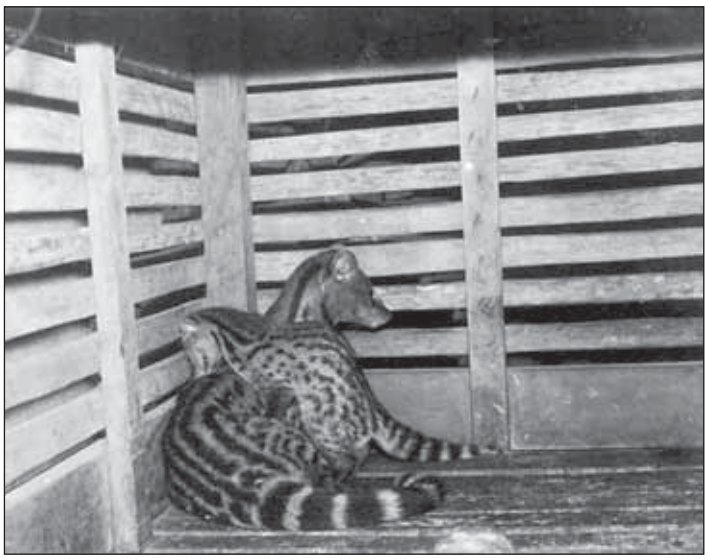

Fig. 5. A six week-old civet kitten growling over the mother during its play behaviour.

Observations

Mating and related activities were observed in captive Small Indian Civets in two seasons, during March–May and during October–December. The frequency of locomotor activity increased during the breeding season. The mean frequency of locomotor activity peaked at 52 times/2-hours of observation time in males and at 40.5/2-hours in females, compared with 31.5 times in males and 26 times in females during other seasons. Vocalisation was most prominent when the females were in heat. The mean frequency of vocalisation increased from 3.6/2-hours to 16/2-hours in males and from 1.7/2-hours to 7/2-hours in females during breeding season. The frequency of scent-marking increased from 8.2/2-hours to 19.5/2-hours in males and from 6.3/2-hours to 11.5/2-hours in females during the breeding season. The frequency of scent-marking was at its highest levels when females were in heat.

Courtship in the Small Indian Civet commenced with a series of "duk-duk-duk" calls from the male. There were 7–8 notes in each of these calls during the oestrous phase of the sex cycle. Males frequently sniffed the scent-marked sites of females. The male also sniffed the posterior quarters of the female (Fig. 1) in heat during courtship. During the first mounting attempts, the female responded with a sharp scream and bit the male. This often ended in a fight, in which both animals might be injured on the nape and tail. Courtship calls re-commenced after 5–30 minutes. After 3–4 such attempts, the female was seen running around the cage, often touching and slightly pushing the male. The male followed and sniffed at the perineal region of the female and finally the female lay down, allowing the male to mount. The body of the female was fully extended with the hind legs slightly raised during this behaviour. The male mounted with forepaws placed on either side of the shoulders of the female. Sometimes, the female tried to move forward in this position, when the male gripped the hair on her nape along with pelvic thrust. The female made a low cat-like call after some time and then the male dismounted. Immediately after dismounting, the female growled and tried to bite the male and then they departed to separate corners of the cage.

Locomotor frequency of the female decreased considerably after copulation. The frequency of feeding increased from once per 2 hours to 8/2-hours by 10 days after copulation and they showed increased appetite. The frequency of scent-marking decreased to a base level of 1.5/2-hours by 10 days after mating, and they stopped scent-marking after 20 days of successful mating. Foetal motility was noticed from the sixth week of pregnancy. There was visible development of teats. Of the four successful matings recorded during the present investigation, the mean gestation period was 67.3 ± 2.1 days. Females did not eat on the day of parturition. Only two months after delivery did the females regain the perineal glandular marking activity.

Litter size varied from two to five. During this investigation, one civet (pregnant while taken from the wild) gave birth to five young. One dead specimen from the wild contained five foetuses in the uterus (Fig. 2), and another two (Fig. 3). Most civet keepers reported litter size as two. Captive civets were infantophagous. In 29% of the known cases, the mother nursed the young ones, in 29% of cases she killed the young ones, and in 42% of cases, the mother killed and ate at least one of the kittens.

The mother breast-fed the young 3–4 times per hour during the first week after parturition. The frequency of breast-feeding reduced to once per hour by the second week and to once per two hours by the third week. This was further reduced to 2–3 times a day by the seventh week. When alarmed, the mother held the kitten in her mouth, gripping the fur on the nape. It licked the whole body of the young ones, and ate the excreta of the kittens.

Weight of the civet kittens ranged between 90 and 110 g at birth (Fig. 4), when they were completely covered with hairs. At birth, they clustered beside the belly of the mother and crawled to reach the teat. The eyes opened on the fifth day. From the eighth day onwards, they walked with a slow pace. By the third week after birth, the kittens rolled over the body of the mother, particularly around the neck region (Fig. 5). They started eating solid food, especially fruits and bits from the mother's food, by the fourth week of age. Scent marking was first observed when they were eight weeks old, but the perineal glandular secretion was not observed until they were eight months old. The body weight of the kitten attained 180–200 g by the end of the second week, 250–300 g by the end of the fourth, 400–500 g by the end of the eighth week, and 1000 g by ten weeks. They were of adult size (3–4 kg) at six months of age.

Discussion

No detailed information is known about the family life and breeding of Small Indian Civet (Prater 1980). Ewer & Wemmer (1974) made some observations on the mating behaviour of the African Civet *Civettictis civetta*. Information from this study could be used to help plan for captive populations of civets. If captive breeding populations of civets are established, they might reduce pressure on the natural populations that civet owners presently depend upon to replace the old and diseased captives (Xavier 1994, Balakrishnan 2002).

The present investigation has revealed that Small Indian Civet has two breeding seasons: October–December and March–May. Young are born in January–February and June–July. January–February is the fruiting season of many trees, such as *Zizyphus* sp., which forms a major food of wild civets in Kerala (Sreedevi 2001). June–July is the rainy season in this area, when wild fruits and other food of civets (Balakrishnan & Sreedevi 2007) are available in plenty (Sreedevi 2001).

Courtship calls are associated with solitary animals that pair only for a short time (Ewer & Wemmer 1974), when the opposite sex can be attracted for mating. Breeding calls and scent-marking were more frequent during the breeding season, before mating. The oestrus phase of females of several species of mammals can be easily recognised by the male through sniffing the posterior quarters or even by sniffing sites scent-marked by the female (Eisenberg & Kleiman 1972, Balakrishnan & Alexander 1985). The present study revealed that male civets sniff the posterior quarters of a potentially receptive female.

The gestation period recorded during this investigation falls within 65–72 days. In an African Civet, the gestation period was recorded as 72 days (Mallinson 1972, cited by Sreedevi 2001). Litter size of African Civet is similar to the present observations of Small Indian Civet: Dorst & Dandelot (1970) recorded 2–4 young per litter and Ewer & Wemmer (1974) recorded 2–3. In Small Indian Civet, the maximum litter size (five) was shown only by wild animals, suggesting that captive populations may suffer from malnutrition, inadequate space, and related physiological effects.

Cannibalism has apparently never been reported in any species of civet. This behaviour has considerable relevance in captive breeding programme as it is believed to be associated with deficiency of phosphorous, salt, cobalt, fibres, and protein. As suggested earlier, wild animals taken into captivity may not rear their progeny in stressful captive conditions (Ewer 1968). Because infanticide may result from cramped and paired caging conditions, civets under captivity should be maintained in semi-natural conditions. Further trials are needed to establish size and layout of cage, and distance from conspecifics.

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References

Balakrishnan, M. 2002. *Captive breeding of Small Indian Civet (*Viverricula indica*)*. Department of Forests & Wildlife, Government of Kerala, Thiruvanathapuram, India.

Balakrishnan, M. & Alexander, K. M. 1985. Sources of body odour and olfactory communication in some Indian mammals. *Indian Review of Life Sciences* 5: 277–313.

Balakrishnan, M. & Sreedevi, M. B. 2007. Husbandry and management of the Small Indian Civet *Viverricula indica* (É. Geoffroy Saint-Hilaire) in Kerala, India. *Small Carnivore Conservation* 36: XX–XX.

Coulson, F. W. 1987. *Surgical pathology.* J. B. Lippincot, Philadelphia, USA.

Dorst, J. & Dandelot, P. 1970. *A field guide to the larger mammals of Africa*. Collins, London.

Eisenberg, J. F. & Kleiman, D. G. 1972. Olfactory communication in mammals. *Annual Review of Ecology and Systematics* 3: 1–32.

Ewer, R. F. 1968. *Ethology of mammals*. Plenum Press, New York, USA.

Ewer, R. F. & Wemmer, C. 1974. The behaviour in captivity of the African Civet (*Civettictis civetta*). *Zeitschrift für Tierpsychologie* 34: 359–394.

Grzimek, B. 1975. *Grzimek's life encyclopedia*, Volume 12. Van Nostrand Reinhold, New York, USA.

Hongfa, X. & Helin, S. 1995. Reproductive behaviour of Small Indian Civets (*V. indica*). *Zoos Print* 10: 29–32.

Kitchener, A. T., Clegg, N., Thomson, H. W. & MacDonald, A. A. 1993. First records of the Malay Civet, *Viverra tangalunga* Gray, 1832, on Seram, with notes on the Seram Bandicoot *Rhynchomeles prattorum* Thomas, 1920. *Zeitschrift für Säugetierkunde*. 58: 378–380.

Nalbandov, A.V. 1970. *Reproductive physiology*. New York, USA: Academic Press.

Prater, S.H. 1980. *The book of Indian animals*. 2nd edition. Bombay Natural History Society, Bombay, India.

Sreedevi, M. B. 2001. *A study on certain aspects of breeding and behaviour of the Small Indian Civet,* Viverricula indica *(Desmarest)*. University of Kerala (Ph.D. dissertation), Thiruvananthapuram, India.

UNEP 1992. *Convention on Biological Diversity*. United Nations Environment Programme, Nairobi.

Xavier, F. 1994. *A study on Small Indian Civet (*Viverricula indica*) as a sustainable wildlife resource*. University of Kerala (Ph.D. thesis), Thiruvananthapuram, India.

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